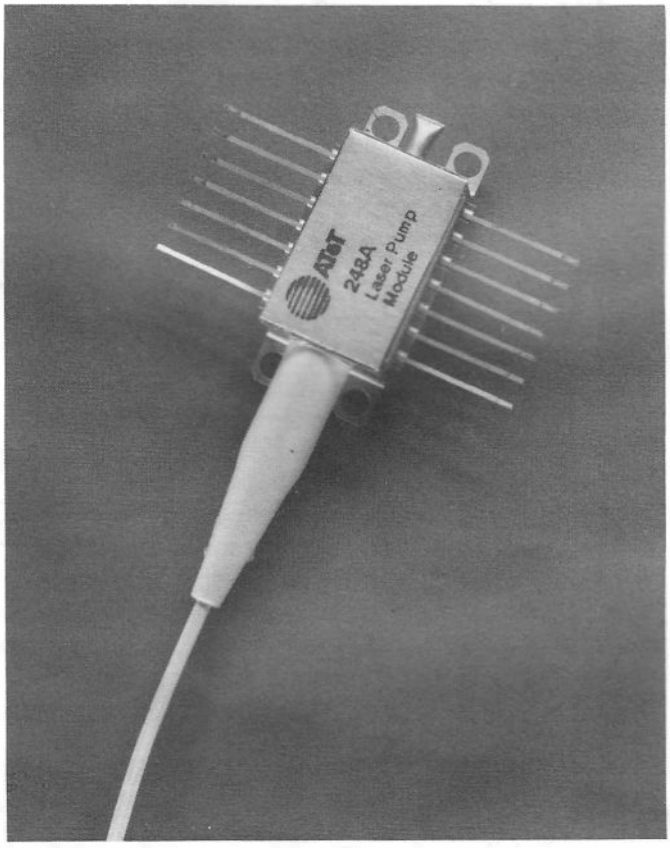
Preliminary Data Sheet
February 1993

AT&T Microelectronics

248-Type Ultrahigh-Reliability Pump Laser Module



The 248-Type Ultrahigh-Reliability Pump Laser Module is ideally suited for fiber amplifier based optical transmission systems that require a long-term life expectancy.

Features

- Extremely high reliability
  — Laser-welded packaging technology used to attain ultrastable long-term operation
- Individually certified for ultrahigh reliability
- InGaAsP/InP capped mesa buried heterostructure (CMBH) 1480 nm multimode laser diode
- CVD diamond submount for low thermal impedance
- Stable single spatial mode kink-free operation over a wide range of temperatures and currents
- Standard low-profile laser-welded, metal hermetic 14-pin butterfly package
- Wide range of stable CW optical output power
- Planar InGaAs PIN photodiode monitor for laser rear facet output
- Single-mode fiber with minicord pigtail cable

Applications

- Undersea optical transmission systems
- Ultrahigh reliability optical communications for military systems

Description

The 248-Type Pump Laser Module is a precision, high-performance, ultrahigh-reliability lightwave component that provides high output power light with wavelengths within the absorption band of an erbium-doped fiber amplifier (EDFA). The 248-Type Pump Laser Module is comprised of a CMBH multimode laser diode, CVD diamond submount, PIN backface monitor, micro-lensed single-mode fiber, and AT&T 100C output fiber pigtails, all encased in a specially designed 14-pin butterfly package.

The 248-Type Pump Laser Module is capable of providing high output power in the 1470 nm to 1490 nm wavelength range for erbium-doped amplifier (EDFA) system application. The pump laser module is designed and individually certified for high-reliability operation and long-term life expectancy. The 1480 nm InGaAsP laser chip utilizes a CMBH design with a CVD diamond submount for high performance and reliability. Chip and facet parameters are optimized for efficient pumping of EDFA. The laser package design includes a microlensed single-mode fiber and a planar InGaAs PIN backface photomonitor assembled in a modular organic-free hermetic package. Laser welding technology is used for critical joints to achieve long-term stability. Each module is fully characterized and traceable. Long-life performance and reliability are ensured through extensive steps of burn-in, overstress, and power aging. The 248-Type Pump Laser Module is available with a typical power output range of 20 mW to 50 mW.

The 248-Type Pump Laser Module has been specifically designed for undersea optical amplifier transmission systems that require long-term life expectancy. The extremely stringent reliability requirements imposed on the 248-Type—necessary to achieve long-term system life—are accomplished through careful design, exacting manufacture, and thorough testing. Each 248-Type undergoes a certification process where the performance parameters are measured before, during, and after environmental stresses. The certification results for each 248-Type Pump Laser Module are then examined to ensure that only the pump laser modules that exhibit performance consistent with long-term system operation are selected for product. Each 248-Type is individually serialized for full traceability and is shipped with test data, certification results, and the final device pedigree.

The 248-Type assembly, test, and certification facilities have all passed the rigorous qualification process required for all facilities that manufacture devices employed in undersea applications. Also, on an ongoing basis, small quantities of product from each manufacturing lot are retained and tested as part of a surveillance program for undersea devices. Each surveillance group is subjected to the complete spectrum of environmental/mechanical stresses required during the qualification process. The surveillance results are reviewed and compiled so that long-term trends can be studied. The reliability performance of the 248-Type Pump Laser Module is a result of a rigorous qualification process combined with an extensive and ongoing surveillance program.

Pin Information

Top View.

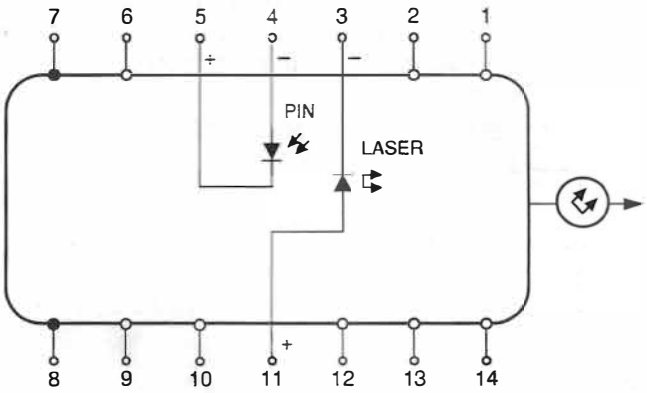


Figure 1. Pin Schematic

Table 1. Pin Descriptions

Pin	Name
1	No Connection
2	No Connection
3	Laser Cathode (–)
4	Backface Monitor Anode (–)
5	Backface Monitor Cathode (+)
6	No Connection
7	Case Ground
8	Case Ground
9	No Connection
10	No Connection
11	Laser Anode (+)
12	No Connection
13	No Connection
14	No Connection

Handling Precautions

Power Sequencing

Adopt the following sequence for turn-on as a matter of good practice to avoid the possibility of damage to the pump laser module from power supply switching transients:

1. All ground connections
2. Most negative supply
3. Most positive supply
4. All remaining connections

Reverse the above order for the proper turn-off sequence.

Mounting Instructions

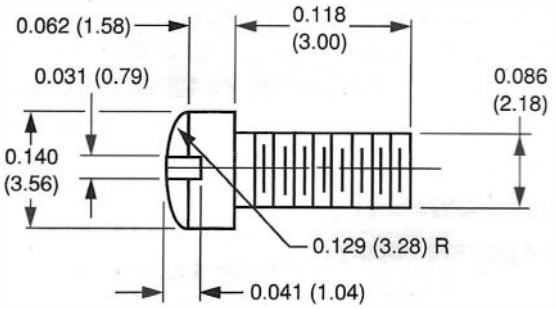
The minimum fiber bend radius is 1.25 in.

To avoid degradation in performance, mount the module on the board as follows (see Figure 2):

1. Place the bottom flange of the module on a flat heat sink at least 0.5 in. x 1.180 in. (12.7 mm x 30 mm) in size. The surface finish of the heat sink should be better than 32 µin. (0.8 µm), and the surface flatness must be better than 0.001 in. (25.4 µm).
2. Mount four #2-56 screws with Fillister heads (M2-3 mm) at the four screw hole locations (see Outline Diagram). The Fillister head diameter must not exceed 0.140 in. (3.55 mm). Do not apply more than 2 in.-lb. of torque to the screws. To minimize package distortion, it is recommended that a washer is used above and beneath each mounting foot.

Handling Precautions (continued)

Mounting Instructions (continued)



Note: Dimensions are inches and (millimeters).

Figure 2. Fillister Head Screw

Electrostatic Discharge

CAUTION: This is a Class 0 ESD device which is susceptible to damage as a result of electrostatic discharge. Take proper precautions during both handling and testing. Follow guidelines such as JEDEC Publication No. 108-A (Dec. 1988).

Absolute Maximum Ratings

Stresses in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to Absolute Maximum Ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Storage Temperature Range	T_{stg}	–20	60	°C
Operating Temperature Range	T_{op}	0	35	°C
Laser Current	I	—	650	mA
Laser Voltage	V	—	2.7	V
Laser Reverse Voltage	V_R	—	–2.0	V
Fiber Output Power	Pf	—	70	mW
PIN Monitor Reverse Voltage	V_{PIN} (R)	—	10	V
PIN Monitor Forward Voltage	V_{PIN} (F)	—	0	V
Pigtail Pull Force (Axial)	F	—	2	lb.
Pigtail Bend Radius	R_p	30	—	mm
Shock	G	—	100	G
Vibration (10 Hz to 2000 Hz)	Vib	—	5	G
Temperature Cycling (–20 °C to +60 °C)	T/C	—	10	Cycles

Characteristics

All specifications listed below are specifically for optical feedback into the pump laser of –40 dB or lower. These specifications will be satisfied throughout the design life of the system. In addition, each specification will be met or exceeded for the operating temperature range (0 °C to 35 °C). Connector effects are not included.

Table 2. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Operating Voltage (CW, 30 mW fiber output)	V_{op}	1.4	1.9	2.2	V
Operating Current (CW, 30 mW fiber output)	I_{op}	—	350	400	mA
Threshold Current	I_{th}	—	50	70	mA
Monitor Reverse-Bias Voltage	V_{RMON}	1.5	5.0	10.0	V
Monitor Current I = Iop	I_{RMON}	0.2	1.5	3.0	mA
Monitor Dark Current (Vdet = –5 V)	I_D	—	1.5	—	nA

Table 3. Optical Characteristics

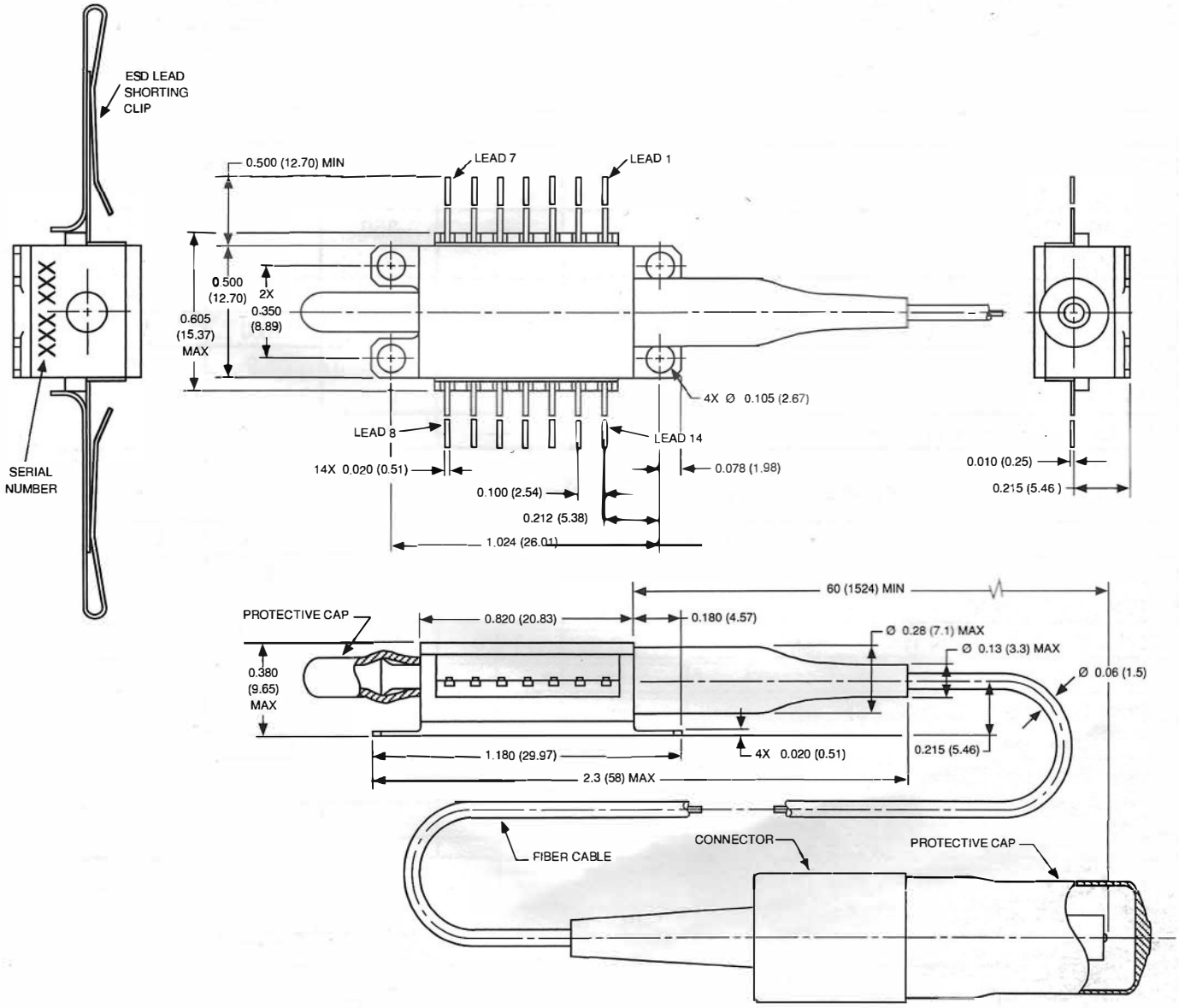
Parameter	Symbol	Min	Typ	Max	Unit
Optical Output Power (CW, I = 350 mA)	Po	20	30	40	mW
Center Wavelength	λc	1470	1480	1490	nm
RMS Spectral Width	$\Delta\lambda_{rms}$	—	5	7	nm
Power Tracking (5 °C to 35 °C) (constant I_{RMON})	ΔPo	—	±0.5	—	dB
Power Extinction Ratio $\frac{Po\ (1470—1490)\ nm}{Po\ (1540—1560)\ nm}$	λR	25	—	—	dB

Table 4. Physical Characteristics

Pigtail Fiber Type	Single-mode AT&T 100C Optical Fiber Lightguide
Jacket Type	AT&T Minicord, 1.55 mm O.D.
Weight (including pigtail)	24 gm
Minimum Radius of Curvature	1.25 in.
Connector Type	Beveled Biconic Connector

Outline Diagram

Dimensions are in inches and (millimeters) and are nominal unless otherwise specified.



CERT.SHIP Test

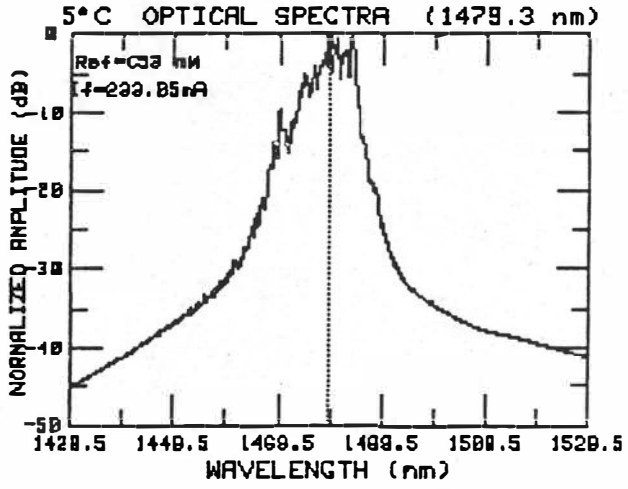
SFC # 248M-604998
Module # 0000604998
Platform # 0000020855

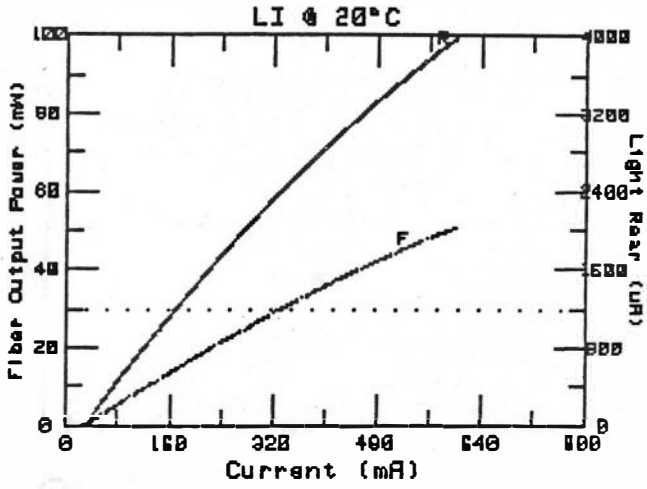
Product Type:248 A

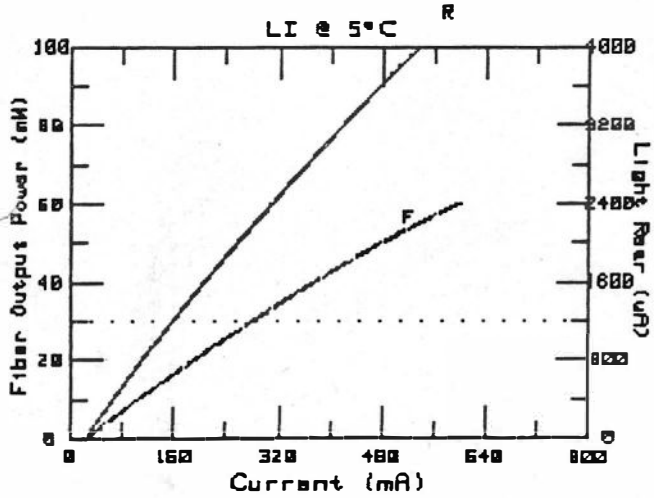
Test Started : 16 Sep 1996 21:21:21

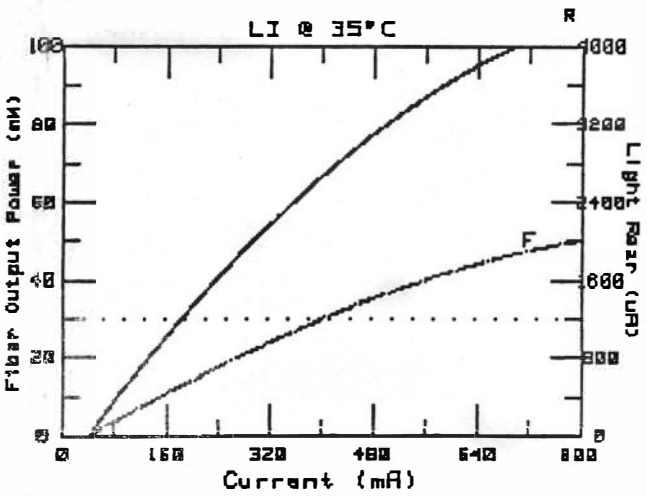
Test done by 80514 on AT&T DCONLY 4
Chip #:VA13343SC861

Software Version: SL2KLI37









BOL Ref's	20 C	5 C	
If	249.9	233.05	mA
Ibd	1814.13	1814.13	uA
Vf	1.33	1.3	V
Wavelength	<N/A>	1479.3	nM
Lf (mW)	22.36	24.93	mW
Lf (dBm)	13.5	14	dBm
FFP	53	53	mW
CE	42.19	47.04	%
Ith (Front)	31.44	23.93	mA

EOL Ref's	20 C	5 C	
If	312.38	291.31	mA
Vf	1.44	1.4	V

PRESSURE TEST
Delta Lf = 0 dB

TORQUE CORRECTED DATA
Delta Lf = -.36 dBm
Delta Ibd = -57.33 uA
Lf @ 5 C = 22.95 mW